

PRODUCTION ENGINEERING MEASURE

FOR METERS, TAUT-BAND SUSPENSION, A-B MOVING IRON VANE

PER SIGNAL CORPS REQUIREMENTS SCS-160

AD626760

TENTH QUARTERLY PROGRESS REPORT

Covering the Period

August 1, 1965 Through October 31, 1965

Signal Corps Contract Number DA 36-039-AMC-01473 (E)

Order Number 21048-PP-63-81-V

U. S. Army Signal Equipment Support Agency

Fort Monmouth, New Jersey

Code 1
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API INSTRUMENTS COMPANY

7100 Wilson Mills Road

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PRODUCTION ENGINEERING REPORT
FOR METERS, TAUT-BAND SUSPENSION, A-C MOVING IRON VANE
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TENTH QUARTERLY PROGRESS REPORT

Covering the Period

August 1, 1965 Through October 31, 1965

Signal Corps Contract Number DA 36-039-AMC-01473 (E)

Order Number 21048-PP-63-81-V

OBJECT: To establish the capability and facilities to manufacture ruggedized, taut-band suspension, A-C iron vane panel meters. The taut-band suspension will result in performance characteristics heretofore unattainable in ruggedized panel meters using conventional pivot-and-jewel construction.

Prepared by: R. H. Nichols, Project Engineer

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API INSTRUMENTS COMPANY
Chesterland, Ohio
Quarterly Report #10

ABSTRACT

Preproduction samples and test reports have been delivered for three of the six contract items (1-1-1-b, 1-1-1-d, and 1-1-1-f).

Preproduction Approvals have been granted for two items (contract items 1-1-1-b and 1-1-1-f).

Construction of the remaining preproduction samples is about 90 percent complete.

The pilot run on contract item 1-2-2 is about 80 percent complete.

PURPOSE OF CONTRACT

This contract is for a Production Engineering Measure and General Report in accordance with Steps I and II Signal Corps Industrial Preparedness Procurement Requirements (SCIPPR) No. 15, dated 1 October 1958, for Meters, Taut Band Suspension, A-C, per Specification SCS-160, dated 11 September 1962.

The primary applicable specifications are SCS-160 and MIL-M-10304. The objects of the contract are (1) to establish the capability to manufacture such meters on a pilot line basis, including actual fabrication of test samples; (2) to obtain preproduction approval of such meters; (3) and to complete a production type run to demonstrate the capability to produce such meters at a rate of fifty units per eight-hour shift.

The meters covered by this contract are 2½ inch and 3½ inch meters, 100° scale, 60 CPS with ranges of 2 milliamperes, 150 volts and 5 amperes.

| Preproduction Samples | Contract Item | Range | Size in Inches |
|-----------------------|---------------|----------------|----------------|
| | 1-1-1 (a) | 2 Milliamperes | 2½ |
| | 1-1-1 (b) | 2 Milliamperes | 3½ |
| | 1-1-1 (c) | 150 Volts | 2½ |
| | 1-1-1 (d) | 150 Volts | 3½ |
| | 1-1-1 (e) | 5 Amperes | 2½ |
| | 1-1-1 (f) | 5 Amperes | 3½ |
| Pilot Run | | | |
| | 1-2-1 | 2 Milliamperes | 2½ |
| | 1-2-2 | 2 Milliamperes | 3½ |
| | 1-2-3 | 150 Volts | 2½ |
| | 1-2-4 | 150 Volts | 3½ |
| | 1-2-5 | 5 Amperes | 2½ |
| | 1-2-6 | 5 Amperes | 3½ |

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REPORT

Preproduction Samples and Tests

Preproduction tests on all 3½ inch meters (2 milliamperes, 5 ampere, and 150 volt ranges) have been completed and the associated test reports and samples have been delivered. Group V tests on 2½ inch 150 volt meters have been completed.

Preproduction Approval has been granted for 3½ inch milliammeters and ammeters.

Preproduction Samples for the remaining tests on 2½ inch meters are 90 percent complete. Testing will be started when all the samples have been completed. A schedule of dates for completion of samples and tests is shown in Table I.

The results of the tests on the voltmeters and ammeters reflected the same overall excellence which was previously reported on the milliammeters. The test data allow no doubt that the API taut-band suspension system in a military panel meter provides a significant advance in the performance characteristics of a-c iron vane meters built to meet specification MIL-M-10304. The improvements are particularly in evidence in the temperature and mechanical endurance tests.

Quality Control Plan

The Inspection and Quality Control Plan was approved in its original form and without revision.

Pilot Run

The final assembly operations of the production type run on 3½ inch, 2 millampere meters were started on October 18th. By the end of the reporting period all the meters had been calibrated and it is estimated that the pilot run, including inspection and testing, was 80 percent complete.

Tooling and Production Processes

During the phases of the pilot run completed through October 31 the techniques, processes, and tooling which had been used on the most recently constructed preproduction samples proved to be acceptable. Two additional items of tooling were made to simplify assembly operations.

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CONFERENCES

On September 17, 1965, a conference was held at API Instruments Company with Mr. Frederick S. Feldheim, USAECOM Project Engineer. Mr. Feldheim conferred with Mr. J. D. Saint-Amour, President; Mr. R. Petruschke, Contract Co-ordinator; Manufacturing Engineering Personnel; and Mr. R. Nichols, Project Engineer.

Mr. Feldheim inspected some of the most recently completed items of pilot line tooling, and he observed the top bracket and moving element assembly operations for parts to be used in the pilot run.

On September 20, 1965, a conference was held between the API Project Engineer and the local Quality Assurance Representative (QAR), Defense Contract Administration Service Region (DCASR), Cleveland. The purpose of the conference was to inform the new QAR of the nature of the contract, product, inspection procedures and testing.

The final assembly operations in the pilot run were witnessed for the Government by Mr. Otis Mabb. Mr. Mabb is with Headquarters, United States Army Electronics Command, Fort Monmouth, New Jersey, Production and Procurement Directorate. Although all operations were not scheduled on the entire pilot run during the period of his visit (October 20 through October 22), all major operations were performed on at least one meter in order to provide an opportunity for observation.

During his visit Mr. Mabb conferred with API Manufacturing Engineering Personnel regarding the work measurement system used to verify the production rate.

On October 21 a conference was held with Mr. Mabb and the local QAR and Mr. Ralph Vassel, Contract Administrator, both from the Cleveland Procurement Office, DCASR. The conference was held at the request of the DCASR personnel in order to clarify for them the nature of the contract and their area of responsibility in connection with the pilot run.

SCHEDULE FOR NEXT QUARTER

The work scheduled for the next quarter will include the following:

- Complete the pilot run now in process (item 1-2-2).
- Start the pilot runs for which approval has been granted (1-2-4 and 1-2-6).
- Finish all preproduction testing and deliver test reports and samples.

Pilot runs on 2½ inch meters may be started in January if approvals are granted by then. This will permit completion of all pilot runs in the February-April quarter.

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CONCLUSION

The success of the preproduction tests completed thus far bear out the premise on which this project was based: that suspending the moving part of an iron vane meter on fine metal ribbons (taut-band suspension) could produce an instrument which not only offers the advantages of commercially available taut-band meters (no friction, excellent repeatability, low temperature influence and low power loss), but also could result in an instrument which would withstand the vibration and shock tests better than conventional pivoted jewel-bearing instruments.

The work schedule for the next two quarters should result in the pilot run being delivered on schedule.

RHN:hh

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TABLE I

PREPRODUCTION TEST SCHEDULE
Revised 11-1-65

| Contract | | Item 1-1-1 | Size Inches | Ra ^{ge} | Assembly Dates | | Test Dates | | MIL-M-10304 Tests | | | |
|----------|----|---------------|----------------|------------------|----------------|--------|------------|--------|----------------------|----|-----|------|
| | | | | | Start | Finish | Start | Finish | I | II | III | IV |
| (b) | 3½ | | 2 MA | 2 | 5-25 | 6-6 | 6-7 | 6-10 | | | V | |
| (b) | 3½ | | 2 MA | 2 | 5-25 | 6-9 | 6-11 | 7-23 | I | II | III | IV |
| (d) | 3½ | | 150 V | 150 | 6-15 | 6-24 | 6-25 | 7-2 | | | V | |
| (f) | 3½ | | 5 Amp | 5 | 6-15 | 6-24 | 6-25 | 7-2 | | | V | |
| (d) | 3½ | | 150 V | 150 | 7-5 | 7-31 | 8-5 | 9-9 | I | II | III | IV |
| (f) | 3½ | | 5 Amp | 5 | 7-5 | 7-31 | 8-5 | 9-9 | I | II | III | IV |
| (c) | 2½ | | 150 V | 150 | 8-1 | 11-15 | 11-20 | 1-15* | I | II | III | IV V |
| (a) | 2½ | | 2 MA | 2 | 8-23 | 11-15 | 11-20 | 1-15* | I | II | III | IV V |
| (e) | 2½ | | 5 Amp | 5 | 8-23 | 11-15 | 11-20 | 1-15* | I | II | III | IV V |

Dates enclosed by a rectangle indicate that the scheduled performance has been accomplished.

* Dates in 1966.

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PROJECT SCHEDULE
NETTERS, TAUT-BAND SUSPENSION ACT HAVING IRON VANE
PARTY NAME: PROJECT IRON VANE
ORDER NO. 21048-PP-63-81-A
CONTRACT NO. DA-36-039-AMC-01473 (E)

| TASK | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 20100 | 20101 | 20102 | 20103 | 20104 | 20105 | 20106 | 20107 | 20108 | 20109 | 20110 | 20111 | 20112 | 20113 | 20114 | 20115 | 20116 | 20117 | 20118 | 20119 | 20120 | 20121 | 20122 | 20123 | 20124 | 20125 | 20126 | 20127 | 20128 | 20129 | 20130 | 20131 | 20132 | 20133 | 20134 | 20135 | 20136 | 20137 | 20138 | 20139 | 20140 | 20141 | 20142 | 20143 | 20144 | 20145 | 20146 | 20147 | 20148 | 20149 | 20150 | 20151 | 20152 | 20153 | 20154 | 20155 | 20156 | 20157 | 20158 | 20159 | 20160 | 20161 | 20162 | 20163 | 20164 | 20165 | 20166 | 20167 | 20168 | 20169 | 20170 | 20171 | 20172 | 20173 | 20174 | 20175 | 20176 | 20177 | 20178 | 20179 | 20180 | 20181 | 20182 | 20183 | 20184 | 20185 | 20186 | 20187 | 20188 | 20189 | 20190 | 20191 | 20192 | 20193 | 20194 | 20195 | 20196 | 20197 | 20198 | 20199 | 20200 | 20201 | 20202 | 20203 | 20204 | 20205 | 20206 | 20207 | 20208 | 20209 | 20210 | 20211 | 20212 | 20213 | 20214 | 20215 | 20216 | 20217 | 20218 | 20219 | 20220 | 20221 | 20222 | 20223 | 20224 | 20225 | 20226 | 20227 | 20228 | 20229 | 20230 | 20231 | 20232 | 20233 | 20234 | 20235 | 20236 | 20237 | 20238 | 20239 | 20240 | 20241 | 20242 | 20243 | 20244 | 20245 | 20246 | 20247 | 20248 | 20249 | 20250 | 20251 | 20252 | 20253 | 20254 | 20255 | 20256 | 20257 | 20258 | 20259 | 20260 | 20261 | 20262 | 20263 | 20264 | 20265 | 20266 | 20267 | 20268 | 20269 | 20270 | 20271 | 20272 | 20273 | 20274 | 20275 | 20276 | 20277 | 20278 | 20279 | 20280 | 20281 | 20282 | 20283 | 20284 | 20285 | 20286 | 20287 | 20288 | 20289 | 20290 | 20291 | 20292 | 20293 | 20294 | 20295 | 20296 | 20297 | 20298 | 20299 | 20300 | 20301 | 20302 | 20303 | 20304 | 20305 | 20306 | 20307 | 20308 | 20309 | 20310 | 20311 | 20312 | 20313 | 20314 | 20315 | 20316 | 20317 | 20318 | 20319 | 20320 | 20321 | 20322 | 20323 | 20324 | 20325 | 20326 | 20327 | 20328 | 20329 | 20330 | 20331 | 20332 | 20333 | 20334 | 20335 | 20336 | 20337 | 20338 | 20339 | 20340 | 20341 | 20342 | 20343 | 20344 | 20345 | 20346 | 20347 | 20348 | 20349 | 20350 | 20351 | 20352 | 20353 | 20354 | 20355 | 20356 | 20357 | 20358 | 20359 | 20360 | 20361 | 20362 | 20363 | 20364 | 20365 | 20366 | 20367 | 20368 | 20369 | 20370 | 20371 | 20372 | 20373 | 20374 | 20375 | 20376 | 20377 | 20378 | 20379 | 20380 | 20381 | 20382 | 20383 | 20384 | 20385 | 20386 | 20387 | 20388 | 20389 | 20390 | 20391 | 20392 | 20393 | 20394 | 20395 | 20396 | 20397 | 20398 | 20399 | 20400 | 20401 | 20402 | 20403 | 20404 | 20405 | 20406 | 20407 | 20408 | 20409 | 20410 | 20411 | 20412 | 20413 | 20414 | 20415 | 20416 | 20417 | 20418 | 20419 | 20420 | 20421 | 20422 | 20423 | 20424 | 20425 | 20426 | 20427 | 20428 | 20429 | 20430 | 20431 | 20432 | 20433 | 20434 | 20435 | 20436 | 20437 | 20438 | 20439 | 20440 | 20441 | 20442 | 20443 | 20444 | 20445 | 20446 | 20447 | 20448 | 20449 | 20450 | 20451 | 20452 | 20453 | 20454 | 20455 | 20456 | 20457 | 20458 | 20459 | 20460 | 20461 | 20462 | 20463 | 20464 | 20465 | 20466 | 20467 | 20468 | 20469 | 20470 | 20471 | 20472 | 20473 | 20474 | 20475 | 20476 | 20477 | 20478 | 20479 | 20480 | 20481 | 20482 | 20483 | 20484 | 20485 | 20486 | 20487 | 20488 | 20489 | 20490 | 20491 | 20492 | 20493 | 20494 | 20495 | 20496 | 20497 | 20498 | 20499 | 20500 | 20501 | 20502 | 20503 | 20504 | 20505 | 20506 | 20507 | 20508 | 20509 | 20510 | 20511 | 20512 | 20513 | 20514 | 20515 | 20516 | 20517 | 20518 | 20519 | 20520 | 20521 | 20522 | 20523 | 20524 | 20525 | 20526 | 20527 | 20528 | 20529 | 20530 | 20531 | 20532 | 20533 | 20534 | 20535 | 20536 | 20537 | 20538 | 20539 | 20540 | 20541 | 20542 | 20543 | 20544 | 20545 | 20546 | 20547 | 20548 | 20549 | 20550 | 20551 | 20552 | 20553 | 20554 | 20555 | 20556 | 20557 | 20558 | 20559 | 20560 | 20561 | 20562 | 20563 | 20564 | 20565 | 20566 | 20567 | 20568 | 20569 | 20570 | 20571 | 20572 | 20573 | 20574 | 20575 | 20576 | 20577 | 20578 | 20579 | 20580 | 20581 | 20582 | 20583 | 20584 | 20585 | 20586 | 20587 | 20588 | 20589 | 20590 | 20591 | 20592 | 20593 | 20594 | 20595 | 20596 | 20597 | 20598 | 20599 | 20600 | 20601 | 20602 | 20603 | 20604 | 20605 | 20606 | 20607 | 20608 | 20609 | 20610 | 20611 | 20612 | 20613 | 20614 | 20615 | 20616 | 20617 | 20618 | 20619 | 20620 | 20621 | 20622 | 20623 | 20624 | 20625 | 20626 | 20627 | 20628 | 20629 | 20630 | 20631 | 20632 | 20633 | 20634 | 20635 | 20636 | 20637 | 20638 | 20639 | 20640 | 20641 | 20642 | 20643 | 20644 | 20645 | 20646 | 20647 | 20648 | 20649 | 20650 | 20651 | 20652 | 20653 | 20654 | 20655 | 20656 | 20657 | 20658 | 20659 | 20660 | 20661 | 20662 | 20663 | 20664 | 20665 | 20666 | 20667 | 20668 | 20669 | 20670 | 20671 | 20672 | 20673 | 20674 | 20675 | 20676 | 20677 | 20678 | 20679 | 20680 | 20681 | 20682 | 20683 | 20684 | 20685 | 20686 | 20687 | 20688 | 20689 | 20690 | 20691 | 20692 | 20693 | 20694 | 20695 | 20696 | 20697 | 20698 | 20699 | 20700 | 20701 | 20702 | 20703 | 20704 | 20705 | 20706 | 20707 | 20708 | 20709 | 20710 | 20711 | 20712 | 20713 | 20714 | 20715 | 20716 | 20717 | 20718 | 20719 | 20720 | 20721 | 20722 | 20723 | 20724 | 20725 | 20726 | 20727 | 20728 | 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20854 | 20855 | 20856 | 20857 | 20858 | 20859 | 20860 | 20861 | 20862 | 20863 | 20864 | 20865 | 20866 | 20867 | 20868 | 20869 | 20870 | 20871 | 20872 | 20873 | 20874 | 20875 | 20876 | 20877 | 20878 | 20879 | 20880 | 20881 | 20882 | 20883 | 20884 | 20885 | 20886 | 20887 | 20888 | 20889 | 20890 | 20891 | 20892 | 20893 | 20894 | 20895 | 20896 | 20897 | 20898 | 20899 | 20900 | 20901 | 20902 | 20903 | 20904 | 20905 | 20906 | 20907 | 20908 | 20909 | 20910 | 20911 | 20912 | 20913 | 20914 | 20915 | 20916 | 20917 | 20918 | 20919 | 20920 | 20921 | 20922 | 20923 | 20924 | 20925 | 20926 | 20927 | 20928 | 20929 | 20930 | 20931 | 20932 | 20933 | 20934 | 20935 | 20936 | 20937 | 20938 | 20939 | 20940 | 20941 | 20942 | 20943 | 20944 | 20945 | 20946 | 20947 | 20948 | 20949 | 20950 | 20951 | 20952 | 20953 | 20954 | 20955 | 20956 | 20957 | 20958 | 20959 | 20960 | 20961 | 20962 | 20963 | 20964 | 20965 | 20966 | 20967 | 20968 | 20969 | 20970 | 20971 | 20972 | 20973 | 20974 | 20975 | 20976 | 20977 | 20978 | 20979 | 20980 | 20981 | 20982 | 20983 | 20984 | 20985 | 20986 | 20987 | 20988 | 20989 | 20990 | 20991 | 20992 | 20993 | 20994 | 20995 | 20996 | 20997 | 20998 | 20999 | 209000 | 209001 | 209002 | 209003 | 209004 | 209005 | 209006 | 209007 | 209008 | 209009 | 209010 | 209011 | 209012 | 209013 | 209014 | 209015 | 209016 | 209017 | 209018 | 209019 | 209020 | 209021 | 209022 | 209023 | 209024 | 209025 | 209026 | 209027 | 209028 | 209029 | 209030 | 209031 | 209032 | 209033 | 209034 | 209035 | 209036 | 209037 | 209038 | 209039 | 209040 | 209041 | 209042 | 209043 | 209044 | 209045 | 209046 | 209047 | 209048 | 209049 | 209050 | 209051 | 209052 | 209053 | 209054 | 209055 | 209056 | 209057 | 209058 | 209059 | 209060 | 209061 | 209062 | 2090 |
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